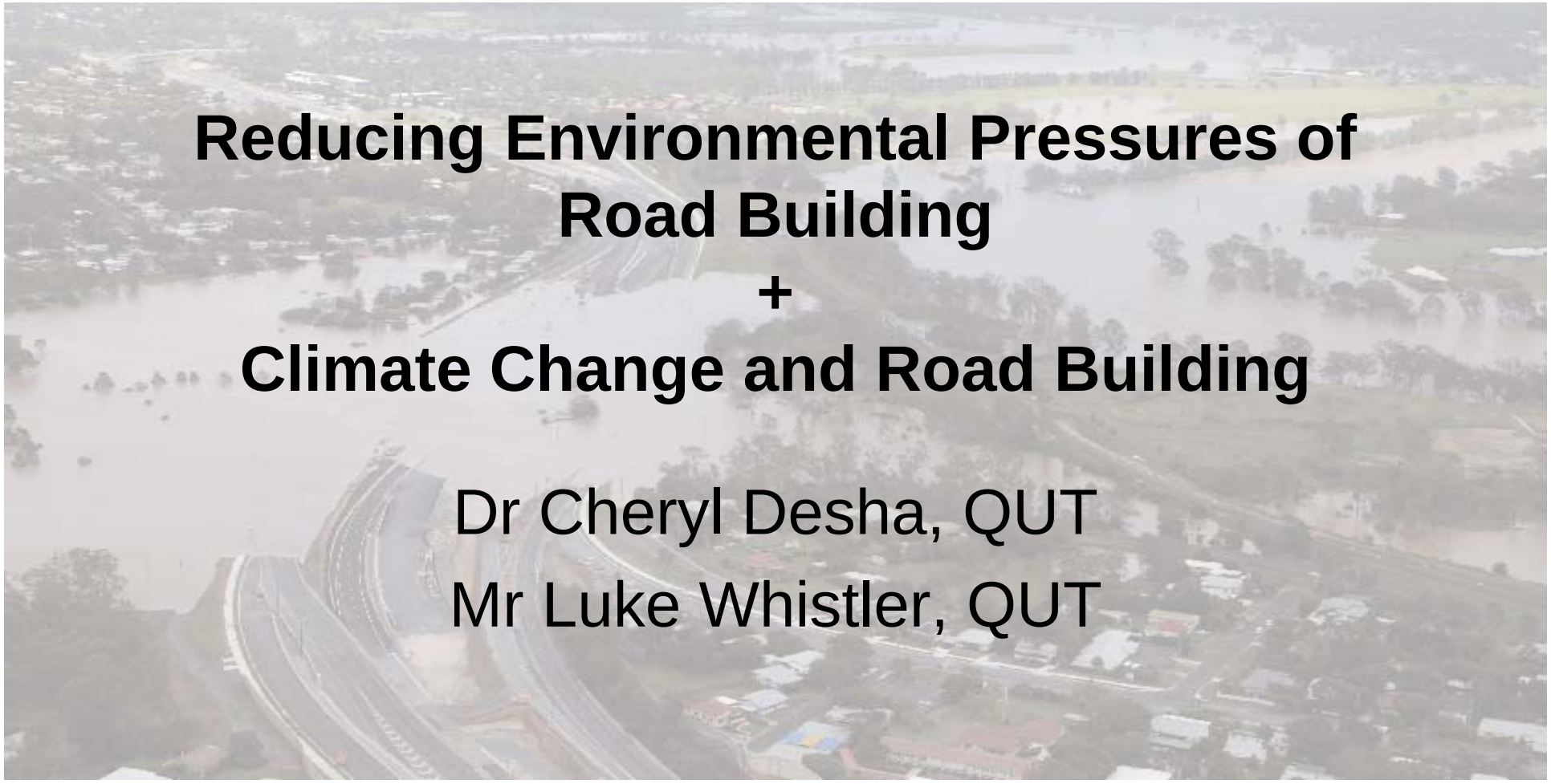


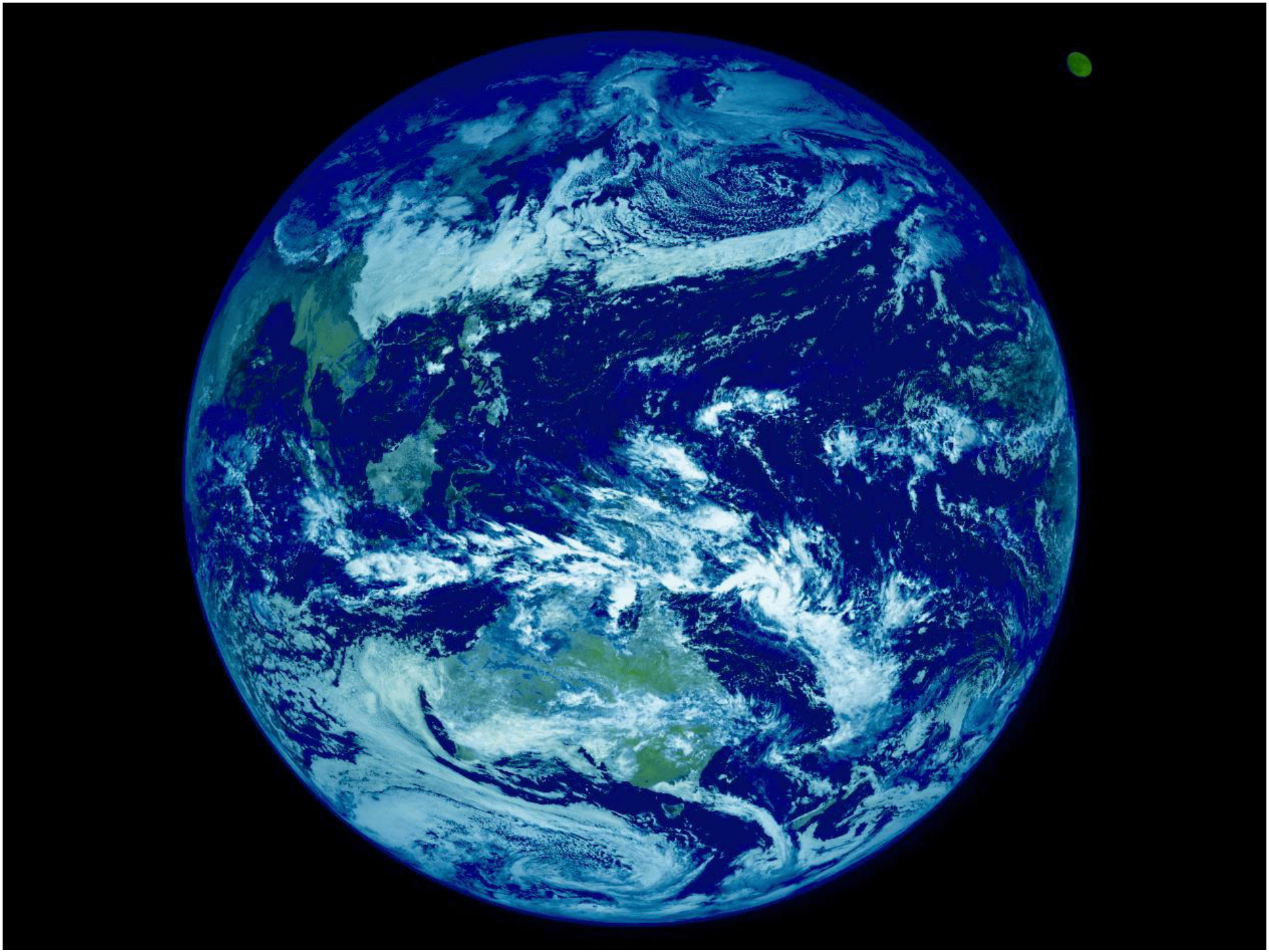
# Reducing Environmental Pressures of Road Building
# +
# Climate Change and Road Building

Dr Cheryl Desha, QUT

Mr Luke Whistler, QUT

**Department of Transport and Main Roads' Engineering Technology Forum 2011**

*Natural Disasters and the Impact on the Transport Network*




# Research Program 1: Greening the Built Environment

## 1-1 Performance of Green Buildings

## **1-3 The Future of Roads**

## 1-5 Biophilic Urbanism

**Department of Transport and Main Roads' Engineering Technology Forum 2011**

*Natural Disasters and the Impact on the Transport Network*

Sustainable
Built Environment
National Research Centre

QUT

John Holland

SWINBURNE UNIVERSITY OF TECHNOLOGY

Queensland Government
Department of Transport and Main Roads

GOVERNMENT OF WESTERN AUSTRALIA

Department of Treasury and Finance
Building Management Works
Office of Strategic Projects

Queensland Government
Department of Public Works

mainroads WESTERN AUSTRALIA

Queensland Government
Infrastructure and Planning

NSW GOVERNMENT Transport Roads & Traffic Authority

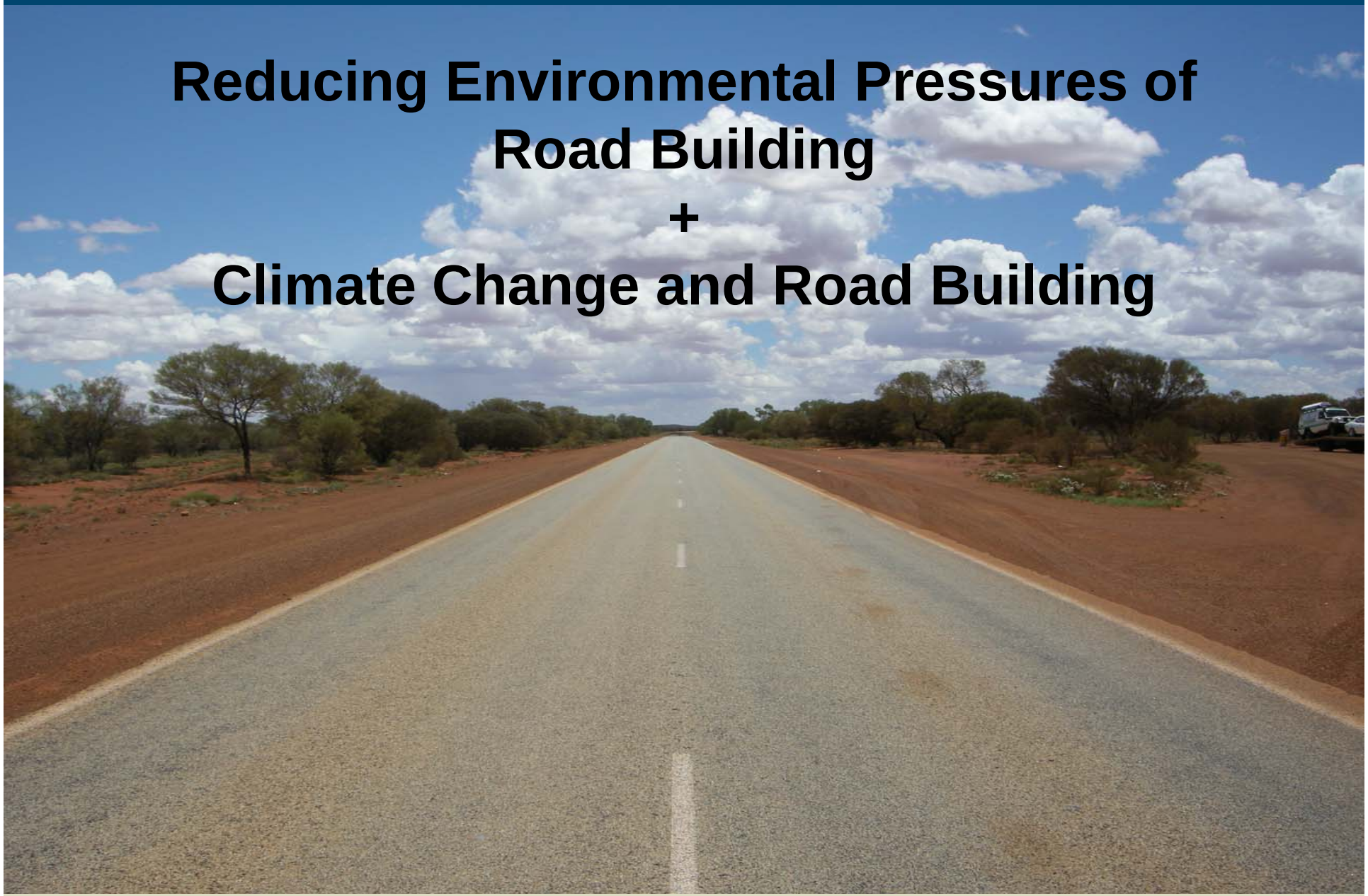
PB PARSONS BRINCKERHOFF 100 YEARS

Curtin University

# Reducing Environmental Pressures of Road Building

# +

# Climate Change and Road Building



# Future of Roads: Project Brief

1. **Reduce** environmental pressures of current road construction
   (identifying options and innovations)

2. **Evaluate** the future pressures for roads
   (producing an environmental, economic and social framework)

3. **Build** strategies for implementing the roads of the future
   (using scenario planning)

# Reducing Environmental Pressures …

| Aggregates Processes | Aggregate Materials Selection |
|---|---|
| Extraction<br>- fuel efficiency and fuel switching<br><br>Crushing<br>– energy efficiency technology<br><br>Transportation<br>- fuel efficiency and fuel switching<br>- shift modes<br>- moisture content and haul weights<br><br>Placement<br>*- saline water in mixing*<br>*- potable water alternatives for dust control* | Redirect waste products to replace extracted aggregates:<br>– Glass<br>– Plastic<br>– Flyash<br>– Recycled road materials<br>– Tyre rubber<br>Aggregate replacement through in-situ stabilisation:<br>– Foamed bitumen<br>– Cement blends<br>– Geopolymers<br>– Red sand<br>– Quick lime<br>– Lime, slag and flyash triple blend<br>– Alkali activation |

# Reducing Environmental Pressures …

| Bitumen | Concrete |
|---|---|
| Materials<br>– *alternate aggregate materials*<br>– *innovative mix design*<br>Processes<br>– *warm mix technologies.*<br>– *cold mix applications*<br>– *Innovations in placement* | Materials<br>– *alternative aggregate materials*<br>*Cement Alternatives*<br>– *sulfo-aluminate cement*<br>– *magnesium-phosphate cement*<br>– *alumino-silicate (Geopolymer) cement*<br>– *geopolymers*<br>Processes<br>– *carbon storage in concrete, in particular magnesium-phosphate cements*<br>– *Innovations in placement* |

# Reducing Environmental Pressures of Road Building

# +

# Climate Change and Road Building


| Category | |
|---|---|
| 1.1 - Purchasing & Procurement | 4.3 - Land Management |
| 1.2 - Reporting & Responsibilities | 4.4 - Waste Management |
| 1.3 - Making Decisions | 5.1 - Functioning Ecosystems |
| 1.4 - Climate Change Adaptation | 5.2 - Enhanced Biodiversity |
| 1.5 - Knowledge Sharing & Capacity Building | 6.3 - Participatory Processes |
| 2.1 - Value For Money | 6.4 - Positive Legacy |
| 2.3 - Economic Life | 6.5 - Urban & Landscape Design |
| 3.1 - Energy Use | 6.6 - Knowledge Sharing |
| 3.2 - Water | 7.2 - Capacity Building |
| 3.3 - Materials Selection & Use | 7.3 – Increased Knowledge and Applied Sustainability |
| 4.1 - GHG Management | |
| 4.2 - Discharges to Air, Land & Water | 7.4 - Equity |

# Future Pressures for Roads

Climate change

Rising price of oil

Materials Shortage

Water scarcity

Increased community action

# Impacts & Implications for Roads

**Temperature and drought**

**Rain patterns and flood events**

**Population increase**

**Cyclones**

**Peak oil**

# Emerging Assessment Tools for Roads



# Example Indicators for Projects:

- Tonnes of aggregate imported
- Travel distance of imported aggregate
- % of alternative materials used
- % of materials recycled (on and off project)
- Volume of bitumen (exposure to oil price)

# Example Indicators for Projects:

- Strategic risk taking on alternative materials.
- Opportunity for innovative materials trials
- Use of results of innovative trials
- Knowledge sharing beyond project

# Road Materials – Emerging Issues …

- Access to materials
- New quarry identification and approvals
- Expansive regional road network
- In-situ stabilisation
- Recycled Aggregates
- …

# Road Materials – Emerging Issues …

**What are the top 3 road material issues facing you in your work role?**

**What are your favourite examples of road innovations in Australia?**

.. Project/ technology/ process/ tools ..

.. Local/ state/ national ..

# Where to from here?

**TMR Forum DVD - two reports**

**Ross Guppy - TMR champion**

**Brisbane Sept 2011 &**

**Outcomes Sept 2012**

**… & Meet us now!**

**See also www.sbenrc.com.au**